NON-PUBLIC?: N
ACCESSION #: 9507030051
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000352

TITLE: Dual Unit SCRAM Due to an Offsite Electrical Transmission Disturbance
EVENT DATE: 02/21/95 LER #: 95-002-01 REPORT DATE: 06/15/95

OTHER FACILITIES INVOLVED: Limerick, Unit 2 DOCKET NO: 05000353

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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Assessment, LGS

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 02/21/95 at 0305 hours, the Unit 1 and Unit 2 Reactor Protection Systems actuated as a result of main turbine trips that occurred within a fraction of a second of each other. An offsite electrical transmission system ground fault actuated Unit 1 and Unit 2 main transformer ground overcurrent protective relays tripping the generator output breakers and the main turbines. Both units were successfully stabilized with no emergency core cooling system or other engineered safety feature actuations. The onsite 4 kV safeguard power distribution system remained energized throughout the event. All of the Limerick Generating Station (LGS) equipment operated per design in response to the ground fault. The protective relays actuated as a result of a breaker failure, a lightning arrestor failure, and the failure of other protective relays on the transmission system to properly isolate the fault from the LGS equipment. The specific causes and corrective actions of the offsite equipment

malfunctions have been investigated. The overcurrent protective relay setpoints are currently being revised to provide better trip coordination between onsite and offsite transmission system equipment.

END OF ABSTRACT

Unit Conditions Prior to the Event

Unit 1 was in Operational Condition (OPCON) 1 (Power Operation) at 100% power level. Unit 2 was in OPCON 1 at 94% power level with the final stages of re-rate startup testing in progress. There were no structures, systems, or components out of service that contributed to this event.

Description of the Event

On February 21, 1995, at 0305 hours, the Unit 1 and Unit 2 Reactor Protection Systems (RPS; EIIS:JC) actuated within a fraction of a second of each other as a result of trips of the main turbines (EIIS:TA). An offsite electrical transmission system (EIIS:EA) disturbance actuated the Unit 1 and Unit 2 main transformer ground overcurrent protective relays (EIIS:EL) which tripped the main generator output breakers (EIIS:BKR) per design (See Figures 1 and 2). This caused both main turbines to trip and actuated the RPS logic for both reactors.

Shift operations personnel implemented Transient Response Implementing Procedure (TRIP) T-101, "Reactor Pressure Vessel Control," for each unit and reactor levels and pressures were quickly returned to their normal values. No Emergency Core Cooling Systems (ECCS) or other Engineered Safety Feature (ESF; EIIS:JE) actuations occurred and no Safety Relief Valves (SRV; EIIS:RV) lifted on either unit. Unit 1 reactor vessel water level reached a minimum of -11 inches and a maximum pressure of 1089 psig. Unit 2 reactor vessel water level reached a minimum of -10 inches and a maximum pressure of 1113 psig. Pre-event reactor vessel water level was +35 inches on both units and reactor pressure was 1005 psig for Unit 1 and 1031 psig for Unit 2. The reactor vessel water level zero reference point is 161 inches above the top of active fuel, and the lowest SRV lift setpoints are 1130 psig for Unit 1 and 1170 psig for Unit 2.

The 4 kV safeguard power busses (EIIS:EK) remained energized through the event and no safeguard bus breaker trips or Emergency Diesel Generator starts occurred. The 4 kV safeguard bus voltages decreased from a nominal 4320 V to a minimum of 4030 V. No 4 kV bus transfers occurred as the voltages remained above the undervoltage transfer setpoint.

Immediately upon the turbine trips, the 13 kV non-safeguard unit auxiliary busses automatically fast transferred from the generator outputs to the pre-selected startup feeds (i.e., the 10 and 20 startup feeds) (EIIS:FK). All of the unit auxiliary busses remained energized throughout this event with the exception of the 13 kV 22 unit auxiliary bus on Unit 2. The 22 bus became de-energized immediately following the transfer due to a malfunction of the 22 auxiliary bus breaker failure logic. Loss of the 22 bus resulted in the loss of several large motors and the Unit 2 normal ventilation systems (EIIS:VA). The loss of the 22 bus loads introduced no significant complications on the shutdown and stabilization of the plant.

The transmission line fault that caused the electrical disturbance was automatically isolated from the transmission system within two (2) seconds, but not before the Unit 1 and unit 2 main transformer protective relays activated. The fault current path that caused the main transformer protective relays to trip is shown on Figure 1. Additionally, several transmission lines automatically tripped as a result of the fault. The transmission system was returned to normal within fifteen (15) minutes as a result of automatic equipment action and manual actions by transmission system personnel. Following a review of the Limerick Generating Station (LGS) equipment response and a review of the investigation of the transmission system malfunctions, Unit 1 was restarted on February 21, 1995 at 2046 hours, and Unit 2 was restarted on February 21, 1995 at 1245 hours.

A four hour notification to the NRC was made at 0634 hours on February 21, 1995, in accordance with the requirements of 10CFR50.72(b)(2)(ii) since this event involved an RPS actuation. This LER is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

Analysis of the Event

The main transformer protective relay actuations, the main turbine trips, and the RPS actuations all occurred per design and all control rods fully inserted. only one significant post scram event occurred and involved the non-safeguard 22 unit auxiliary bus breaker trip. The loss of the 22 bus introduced no significant complications on the shutdown of the plant. Operations personnel response to the dual unit transient was excellent and both units were quickly stabilized in the

hot shutdown condition. No release of radioactive material occurred and no ECCS or ESF actuations (except the RPS) occurred as a result of this event.

The 4 kV safeguard busses and the 13 kV non-safeguard supplies (i.e., the 10 and the 20 busses) remained energized throughout the event. The offsite electrical disturbance did result in breaker trips on 2 of the 3 transmission lines that feed the LGS 220 kV substation (i.e., the 220-60 and 220-61 transmission lines), however, review of the various event recorders have indicated that both lines were not de-energized coincidently. The feed to the 220-61 line tripped as a result of the initial fault caused by the lightning arrestor failure. This line returned to service automatically, approximately four seconds after it tripped. The feed to the 220-60 line isolated (tripped) due to transformer ground fault current at another substation. Although it cannot be definitively demonstrated, it has been concluded that the 220-61 feed to LGS 220kV substation was re-established approximately 0.5 seconds before the 220-60 feed to the LGS 220kV substation tripped. Therefore, there were two independent sources of offsite power available to LGS throughout the event.

An analysis of the effect of the fault and associated protective relay actuations concluded that the offsite transmission system stability was not significantly impacted. Automatic and manual actions were implemented to limit the impact of the fault and to restore the tripped transmission lines. Sufficient on-line generation capacity existed to supply the system load throughout the event even with the loss of 2100 MWe due to the trip of both LGS units. This transient is bounded by the offsite power system transient stability studies discussed in the LGS Updated Final Safety Analysis Report (UFSAR) Section 8.2.2.

Cause of the Event

The cause of the actuation of the main transformer protection relays was the result of a combination of failures. Breaker 245 at the Whitpain Substation malfunctioned when opened by a transmission system operator and caused a voltage spike. This voltage spike caused a lightning arrestor on the 220-16 transmission line to fail, resulting in a ground fault. The primary and secondary ground fault detection relays failed to properly trip the 905 breaker at the Whitpain Substation before the LGS units tripped. All of the LGS equipment operated per design in response to the ground fault.

The specific causes and corrective actions relating to the malfunctioning breaker, lightning arrestor and protective relays are the subject of an ongoing internal PECO Energy Company investigation. The results of this investigation have been provided to the NRC Resident Inspector.

Corrective Actions

The ground fault detection relay settings for the LGS Unit 1 and Unit 2 main transformers are currently being changed to provide better coordination with other transmission system equipment.

Although not a causal factor of this event, corrective actions have been and will be taken to address the malfunction of the 22 auxiliary bus breaker.

The corrective actions from the offsite investigation will provide enhanced reliability of the transmission system and have been provided to the NRC Resident Inspector.

Previous Similar Occurrences

None

Figure 1 omitted.

Figure 2 "LIMERICK GENERATING STATION SINGLE LINE DIAGRAM" omitted.

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